## WE CLAIM:

- 1. A device for insertion into a body of a subject being treated, the device delivering localized x-ray radiation, comprising:
- a shaft, including a proximal and a distal portion;
- a vacuum housing coupled to the distal portion of the shaft;
- an anode disposed within the vacuum housing; and a cathode structure disposed within the vacuum housing, the cathode structure including a thin diamond film, the thin diamond film being operative with the anode to produce the localized x-ray radiation.

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2. The device of claim 1 further comprising a voltage source coupled to the proximal portion of the shaft and operative with the anode and cathode structure to produce the localized x-ray radiation.

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- 3. The device of claim 1 further comprising a getter disposed within the vacuum housing.
- 4. The device of claim 1 wherein the cathode 25 structure further comprises a getter on which the thin diamond film is disposed.

- 5. The device of claim 4 wherein the getter is sufficiently conductive to facilitate the application of an electric potential to the thin diamond film.
- 5 6. The device of claim 4 wherein the getter is comprised of approximately 70% zirconium, 24.6% vanadium, and 5.4% iron.
- 7. The device of claim 1 wherein the vacuum 10 housing further comprises an insulator.
  - 8. The device of claim 1 wherein the anode is comprised of tungsten.
- 9. The device of claim 1 wherein the cathode structure is comprised of a molybdenum base on which the thin diamond film is disposed.
- 10. The device of claim 1 wherein the cathode 20 structure is comprised of a silicon base on which the thin diamond film is disposed.
- 11. The device of claim 1 wherein the cathode structure is comprised of a tantalum base on which the thin diamond film is disposed.
  - 12. The device of claim 1 wherein an outer diameter of the integrated device is less than or equal to approximately two and one-half millimeter.

13. The device of claim 12 wherein an outer diameter of the integrated device is less than or equal to one and one-quarter millimeter.

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- 14. The device of claim 1 further comprising a coaxial conductor having a proximal and distal portion, the coaxial conductor coupled to the anode and the cathode, the coaxial conductor disposed within the shaft and coupled to, the voltage source.
- 15. The device of claim 1 wherein the shaft is a catheter and the vacuum housing is disposed within the catheter.

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16. A device for insertion into a body of a subject being treated, the device delivering localized x-ray radiation, comprising:

a vacuum housing;

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an anode, disposed within the vacuum housing; and a cathode structure disposed within the vacuum housing, including a thin diamond film disposed on a getter, the thin diamond film being operative with the anode to produce the localized x-ray radiation.

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17. The device of claim 16 further comprising a voltage source operative with the anode and thin diamond film to generate localized radiation.

- 18. The device of claim 16 wherein the getter is sufficiently conductive to facilitate the application of an electric potential to the thin diamond film.
- 19. The device of claim 16 wherein the getter is comprised of approximately 70% zirconium, 24.6% vanadium, and 5.4% iron.
- 20. The device of claim 16 wherein the anode is, 10 comprised of tungsten.
  - 21. The device of claim 16 further comprising a shaft including a proximal and a distal portion, the vacuum housing coupled to the distal portion.

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- 22. The device of claim 21 wherein the shaft is a catheter and the vacuum housing is disposed within the catheter.
- 23. The device of claim 16 wherein an outer diameter of the integrated device is less than or equal to approximately one and one-quarter millimeter.
- 24. The device of claim 16 wherein the vacuum 25 housing further comprises an insulator.

25. A device for insertion into a body of a subject being treated, the device delivering localized x-ray radiation, comprising:

an anode;

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a cathode structure operative with the anode to produce localized x-ray radiation; and

a vacuum housing enclosing the anode and the cathode structure, an outer diameter of the housing being less than or equal to approximately one and one-quarter millimeter.

26. A method for fabricating a device for producing localized x-ray radiation, the device being capable of insertion into a body of a subject being treated, the method comprising the steps of:

providing a getter having a tip portion corresponding to a cathode structure where the getter has an activation temperature;

forming a thin diamond film on the tip portion of
the getter at a temperature less than the activation
temperature to provide a thin diamond film cathode;

disposing the cathode within a vacuum housing; and

increasing the temperature to the activation 25 temperature to activate the getter.

- 27. The method of claim 26, further comprising the step of providing a voltage source, the voltage source operative with the cathode structure to generate the localized x-ray radiation.
- 28. The method of claim 26, wherein the getter is shaped into a cone shape.
- 29. The method of claim 26, wherein the getter , 10 is shaped into a cone shape with a rounded apex.

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30. The method of claim 26, wherein the thin diamond film is formed using a laser ion source.